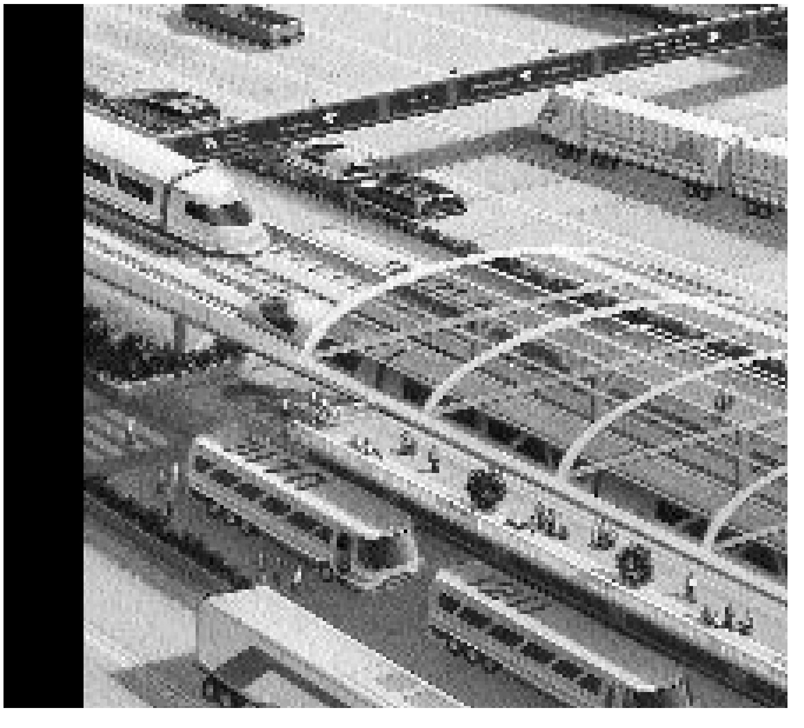
FIFTEEN-YEAR DEPLOYMENT OVERVIEW



This section defines the elements of advanced transportation systems in terms of new or enhanced services that will be delivered to transportation system users over the next 15 years. Benefits and costs are estimated, as are cost allocations for public infrastructure investments and private markets.

The ATS deployment overview provided here assumes that all ATS partners play their roles in pursuing the ATS vision as described in the previous section. While a fully supported ATS Program at Caltrans is a necessary element of this, it is not by itself sufficient. There are many others in addition to Caltrans, in both the public and private sectors nationwide who, in many cases, play a larger or more significant role in the development of ATS across the nation. The deployment milestones and evolutionary paths presented on the following pages, therefore, are scenarios depicting what can happen if an effective ATS partnership is realized. As needs and technologies change, each deployment scenario will be re-evaluated for its importance and benefit, taking into consideration any new or more immediate needs. This will be a critical process so that the program plan can be adjusted as necessary. This on-going evaluation will ensure that the ATS Program will continue to grow and change to satisfy user needs in the future.

This deployment overview details the application of aerospace, defense, computer, communications, and other technologies to the vehicles, facilities, and services that make up California's transportation system. These technologies apply across all modes and throughout all levels of the system. The transportation system includes public transportation; paratransit; rail, maritime and air transportation; highways, including freeways, urban arterials and city streets; and, ridesharing and other high-occupancy-vehicle systems. Movement of goods, services and information, as well as people, is addressed. Alternatives to travel such as telecommuting, teleconferencing, telebanking, and teleshopping are incorporated, as are alternative vehicle systems, including new families of light-weight and alternative fueled vehicles. New technologies will apply to urban, suburban, and rural environments and will involve all of Caltrans' transportation functions including planning, design, construction, operations, and maintenance.

With ATS deployment, California's competitiveness would be enhanced and defense industry conversion greatly facilitated. Future marketability of products and business opportunities worldwide that result from development and application of ATS technology should provide strong incentives for private sector participation.

Elements of ATS

Following is a brief summary of the elements of advanced transportation system deployments. These are discussed in terms of new or enhanced services that will be provided to transportation system users, whether individuals, vehicle fleet operators or transportation infrastructure managers. Where appropriate, user services are defined consistent with those identified in the National ITS Program Plan. The milestones outlined on pages 41-49 illustrate feasible deployment dates of user services at increasing levels of functionality. In many cases, multiple services can be supported by a single ATS technology "package." In fact, it is the integration of multiple services that defines the ATS vision and holds the greatest promise for benefiting the 21st century transportation user. The reader is referred to "Deployment Evolution" on page 50, for a discussion of this critical aspect of ATS deployment. It must be noted also that each deployment milestone will require research, development and testing activities on the part of ATS partners. While these are not detailed in this section, they are taken into account in determining feasible deployment dates. Such activities required on the part of Caltrans and its immediate partners in the ATS Program are detailed in the "Five-Year Program Plan" section of this document.

Elements of ATS: Transportation Information Services

Smart Traveler/Modal Services

One of the most immediate and cost-effective ways to improve mobility is to provide the transportation system user with timely travel information. Users require this information to make informed decisions to most effectively meet their transportation needs. Accessing **pre-trip travel information** from either home or at work will give travelers the ability to select their preferred form of transportation (private vehicle, transit, rail, etc.) and get route and schedule information which incorporates actual conditions on the system (delays, spills, accidents, etc). Recording traveler choices will give the system the information needed to update the data bases for subsequent queries.

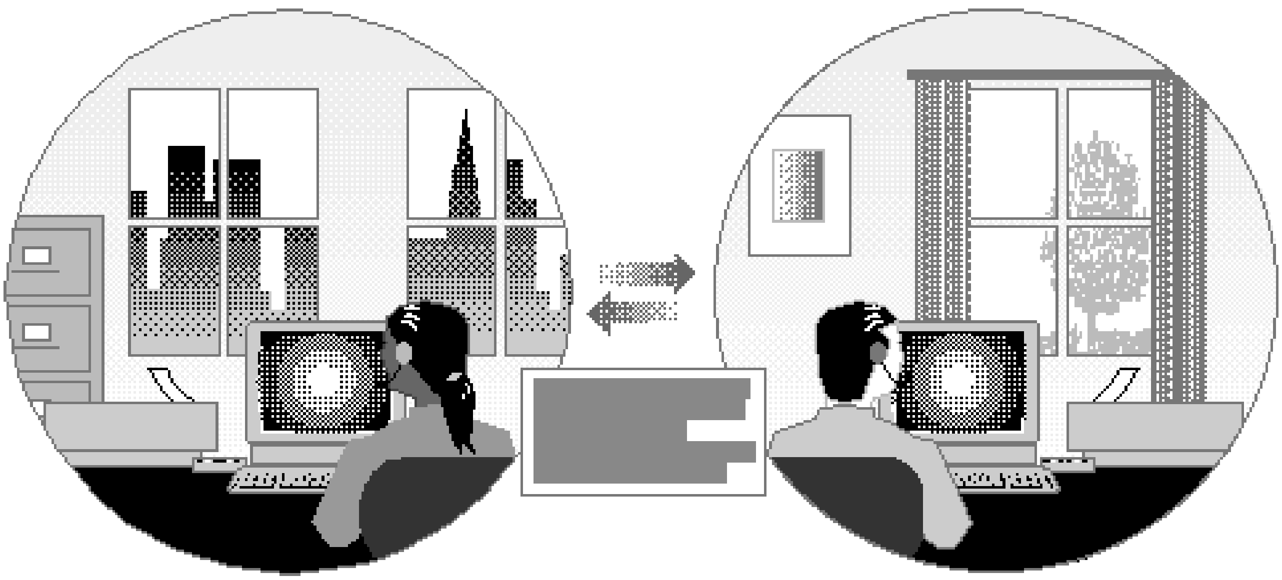
Once the travel choice is made, there are a variety of user services that will help both drivers and passengers to reach their destination quickly, easily and in a safe fashion. After the trip has begun, an **en-route driver advisory** will provide the driver (whether it be of a commercial, transit or private vehicle) with an accurate, up-to-the-minute picture of conditions along the chosen route; while **route guidance** will give turn directions and other instructions (based upon vehicle and/or load characteristics) to enable the driver to reach the desired destination. Hotel, restaurant, service station and other travel information vital to the success of any trip will be available through **traveler services information**—an "electronic yellow pages" service. After the trip has begun, transit riders will be able to reach their destinations more quickly and efficiently, changing routes and modes during their trip if necessary, using information provided through **en-route transit advisory** services. All systems can be designed to provide information in a variety of languages, and for the vision and hearing impaired. This is a must in a diverse society.

Through new developments in real-time **ride matching and reservations,** commuters traveling between similar origins and destinations will soon be able to get information that will allow them to find a match to meet their needs, whether it is for a single trip, recurring trips, or en-route pickups. An advanced transportation interactive information system becomes even more important as transportation management systems mature, integrating traffic conditions data, modal choices, and real-time information with system management strategies.

Elements of ATS: Transportation Information Services

Travel Substitution

ATS technologies can improve and enhance transportation demand management through travel substitution. Work, education, health care, banking, shopping and other activities that have required travel will soon be done, in whole or in part, using advanced telecommunications—moving information and services rather than people. Since the 1980s, telecommuting, teleconferencing, telebanking, and teleshopping have grown more popular. America's investment in roads, bridges and transit facilities has evolved into high-tech information systems. Nationwide, a record $489 million will be spent in this area between 1993 and 1998. With resolution imminent on key regulatory issues, the technological revolution expected in the 1990s, termed the "Information Superhighway," will deliver voice, video and computer data simultaneously from coast to coast and into every home that is equipped with a telephone and television or computer screen by the year 2015. Interactive, multimedia systems such as smart phones, interactive TV, advanced personal computers and other products will deliver vastly expanded information and transactional services to Californians. These will be driven in large part by market forces and will extend well beyond transportation, involving entertainment, educational, and "electronic yellow page" services, as well as the Smart Traveler services described previously. The result should greatly increase opportunities for substituting telecommunications for other modes of travel, resulting in a beneficial effect on the rest of the transportation system.



Elements of ATS: Advanced Vehicles

Smart Vehicles

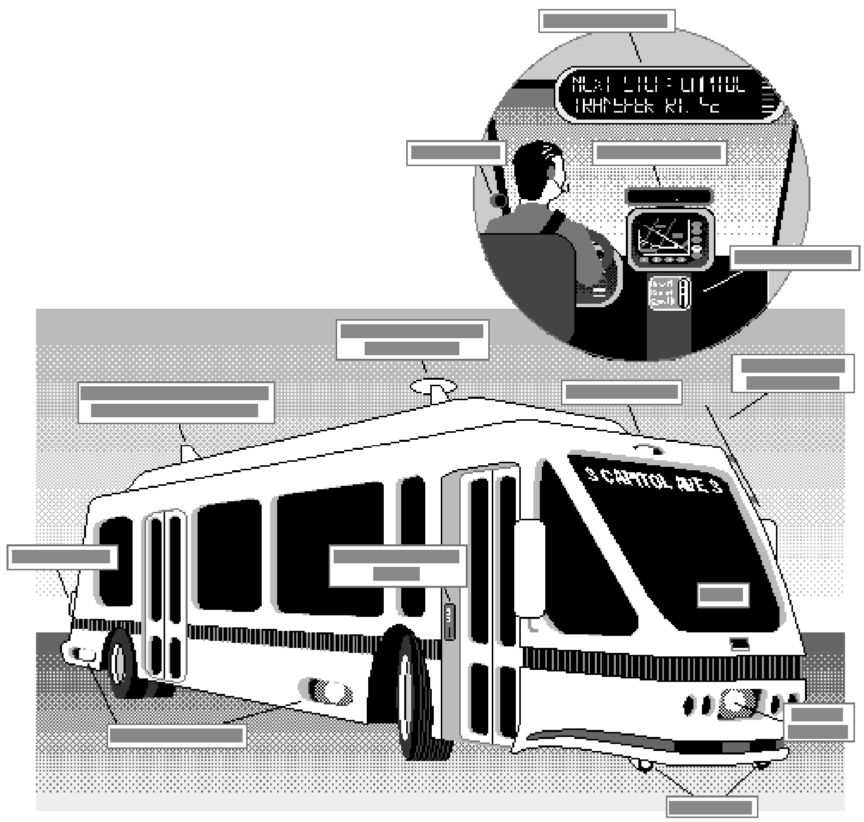
Smart vehicles can be trucks, buses, cars, trains, ships or airplanes. They are “smart” because they have communications, navigation, computer, and/or sensors/actuator systems that can provide information or assistance to operators, as well as passengers. In addition, they can contain operator advisory capabilities, smart fare card readers, locator devices and in-vehicle signs and displays. A significant increase in driver and passenger safety, as well as a reduction in the number and severity of accidents are the primary targets in the development of smart vehicle technologies.

The implementation of both **longitudinal and lateral collision avoidance technologies** will result in reducing both the number and severity of collisions that occur from fast-approaching and overtaking traffic, lane encroachment, obstacles within the back-up path, and facilities with close lateral clearance, etc. Accidents caused by vehicles within the driver’s blind spot, and collisions occurring at intersections, blind curves, railroad grade crossings, or anywhere in which impaired or reduced visibility is a causal factor, will be significantly reduced using technologies designed for **intersection collision avoidance** and **vision enhancement for crash avoidance.** Injuries caused by vehicle collisions will be reduced through **pre-crash restraint deployment,** a means to anticipate an imminent collision and to activate passenger safety systems prior to the actual impact.

Better levels of service than are available today in terms of safety, efficiency of operation, and comfort will be made available through **fully automated vehicle operation**. Safety will be significantly enhanced through **on-board safety monitoring** technologies which can detect tire air loss, speeds unsafe for negotiating impending curves, and the safety status of a vehicle, cargo, and driver at mainline speed.

Transit users will benefit by the availability of **personalized public transit** which integrates various flexible-route and demand-responsive vehicles (buses, shuttles, taxis, carpools, jitneys) into a cost-effective transit feeder and door-to-door “personalized” public transportation system.

California has 22 million vehicles operating on 180,000 miles of roads and rails. This program will develop system/vehicle controls to make existing infrastructure perform at a much higher level of efficiency.



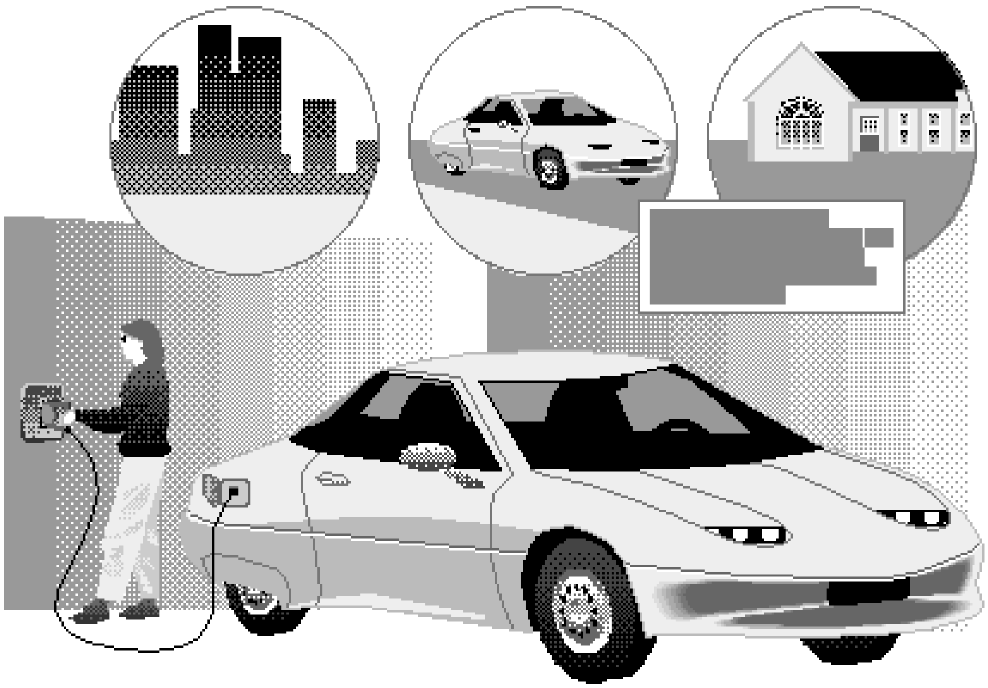
Elements of ATS: Advanced Vehicles

Alternative Fuels and Alternative Vehicles

Caltrans' primary role in the development of ATS is developing the supporting infrastructure that promotes the effective and widespread use of efficient transportation technologies, including the use of alternative fuels and alternative vehicles. The New Technology and Research Program will stay informed of developments in alternative fuels and vehicles technologies to assure that system and program planning includes these changing technologies and that the impact these technologies have on the infrastructure is analyzed on a timely basis.

Alternative vehicles include narrow-width commuter vehicles, neighborhood or station vehicles, and vehicles with advanced propulsion systems such as electric, electric hybrids, and fuel cells. The technologies currently being developed include advanced vehicles that utilize innovative designs to promote efficient energy and space utilization, and advanced energy systems including fuel cells.

Alternative fuels include electricity, ethanol, liquefied petroleum gas, methanol, natural gas, and hydrogen.



High-Speed Ground Systems

Caltrans' initial focus for high-speed ground systems is high-speed trains, which travel in excess of 125 mph. Such systems can use steel-wheel-on-steel-rail technology or magnetic levitation (maglev), whereby the train travels on a magnetic cushion generated by electricity. A number of high-speed wheel/steel rail systems are in operation around the world, the fastest being the French TGV which operates at 186 mph, in revenue service. Maglev systems are being tested in Germany and Japan at test speeds over 300 mph.

Intercity High-Speed Ground Transportation Commission Studies

Caltrans is working to develop the most feasible and effective plan for implementing high-speed ground transportation in California. The ATS Program supports these efforts by conducting complementary research to address pressing technical questions, financial implications and issues pertaining to safety and environmental matters.

Air Transportation

Air transportation is one of the most popular means of transportation. With this popularity often comes extremely high, and often conflicting, expectations. Travelers want a wide variety of flight options with easy access to and from airports, yet generally have little tolerance for the things that are often associated with air transportation—aircraft noise, perceived high ticket prices, congested roads/terminals and delayed flights. The need for improvements in the air transportation system in California and elsewhere is widely recognized.

The problems and opportunities surrounding the improvement of air transportation systems are of particular concern to the ATS Program. Growth in air transportation is leading to increasing levels of air traffic congestion and delay. New aircraft types are being developed; new airport concepts are being proposed; and extensive efforts are being made to increase the levels of automation in the air traffic control system and to utilize new sensor, guidance and communications technologies.

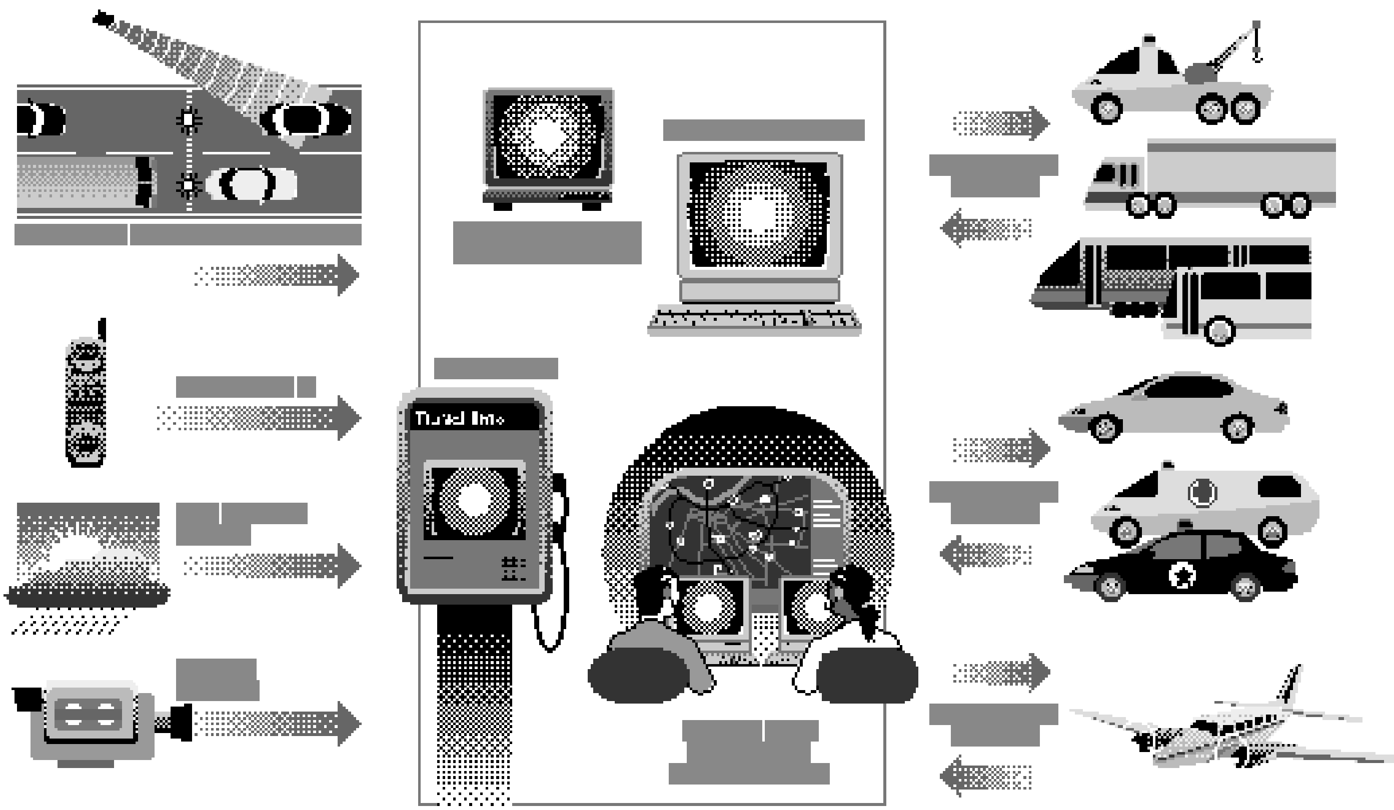
To effectively utilize new developments and meet future needs, the ATS Program established a collaborative Air Transportation Research Center (ATRC) at UCB's Institute for Transportation Studies. The combined strengths of Caltrans and the university permit a coordinated systems approach to air transportation problems. The ATRC is a cooperative activity to develop programs for air transportation technology research that will be mutually beneficial to California and the national air transportation network.

Elements of ATS: Transportation Management Systems

Multimodal Traffic Management

The most immediate benefit of advanced transportation management systems is the integration of freeway and surface arterial operations so that travel corridors and areas can be efficiently managed while retaining local community goals. **Travel demand management** applications include monitoring high-occupancy-vehicle lane use, parking control and road access pricing and prioritization schemes to reduce roadway congestion and air pollution.

California's roadway infrastructure is "getting smarter" with many segments now containing video surveillance cameras, ramp meters, and changeable message signs, etc. Caltrans is developing plans for Transportation Operations Systems (TOS) in every major urban area in California. These will enable centralized surveillance and control of freeways in coordination with other system (local, transit) operations.



Managing the movement of traffic on streets and highways, including the control of signal systems and freeway control techniques such as ramp metering, falls under **traffic control** technologies. Functions include traffic monitoring, incident detection, ramp meter control and dissemination of traffic information to the public through changeable message signs; Highway Advisory Radio (HAR), Highway Advisory Telephone (HAT) and other Traveler Information Systems (TIS) features; and, links to commercial TV and radio. TOS implementation is expected to take place over the next decade in California.

With the addition of advanced driver information systems, traffic can be diverted from over-saturated segments (typically freeways) to underutilized segments (typically arterials parallel to freeways), and the transportation network optimized for this balanced demand with the consent of local communities. Vehicles diverted from congested freeway segments to arterials because of route guidance from the transportation management center can then be "green waved" through the arterial network. This capability is particularly important during incidents which account for more than half of the traffic congestion in California. Automatic speed limitations can reduce the effect on local communities.

Existing capabilities for detecting incidents and taking the appropriate actions in response to them will be enhanced using **incident response and management** techniques. **Emergency notification and personal security systems** will permit immediate notification of an incident and send an immediate request for assistance after an incident has occurred.

Public travel security needs innovative applications of technology to improve the security of public transportation including the detection, identification, and notification of security incidents.

Electronic payment systems may soon eliminate the need for toll plazas and other roadside equipment. A German Global Positioning System (GPS) based road pricing and toll collection system which requires no road infrastructure is being tested by the European Union (GPS, World, Mar 95, p.36).

Elements of ATS: Transportation Management Systems

Advanced Fleet Management

Control systems, such as those envisioned by the ATS Program, can reduce energy requirements and traffic congestion while improving service to producers, shippers and their clients.

The application of smart vehicle technology to truck, rail, planes and buses will improve the safety and operation of any transportation system.

The effectiveness of goods movement systems within California and the nation determines what goods are available, what will be imported, where manufacturing facilities will be located, where people will live, and what other transportation systems will be required. **Commercial fleet management** will enhance real-time communications between commercial vehicle drivers, dispatchers, and intermodal transportation providers, thus reducing delays and providing commercial drivers and dispatchers with real-time routing information in response to congestion or incidents.

Special requirements for the application of smart traveler and smart vehicle technologies to heavy vehicles (e.g., trucks) may include the need for point-to-point non-stop operation while satisfying regulatory requirements such as the issuance of licenses and permits, record keeping, tax collections, and inspection and weighing across multiple jurisdictions and national borders. Commercial vehicle preclearance technologies will enable automatic weight, credential, and safety checks thus eliminating the need for vehicles to stop and undergo similar checks a number of times.

Commercial vehicle administrative processes consist of the electronic purchase of credentials permitting carriers to file applications electronically for registration, trip permits, oversize/overweight permits, or hazardous materials permits. Automated mileage and fuel reporting and auditing will permit carriers to automatically record the vehicle trip miles and fuel purchased in each state. Advanced vehicle electronic systems can also be applied to various public transportation modes through **public transportation management.**

Safety and emergency responses will be greatly enhanced using advanced technologies. **Automated roadside safety/emissions inspections** will provide communication and automation support to inspectors, making the inspection process more efficient. Automatic vehicle identification/location technology will be of immense help in emergency response operations. Reducing the time from receipt of notification of an incident by a operator to arrival of the emergency vehicles on the scene will be expedited using **emergency vehicle management** technologies. Emergency vehicles, such as ambulances or tow trucks, could reach the scene of an incident faster, potentially saving lives and more quickly resolving the incident. Once at the scene, emergency vehicle operators could also provide on-line surveillance for the traffic control center using a roadway-vehicle communications system.

Elements of ATS: Infrastructure Construction and Maintenance

Successful achievement of the ATS vision implies the presence of an infrastructure capable of meeting the needs of tomorrow's traveling public. The demand for transportation resources will continue to grow with our ever increasing population. At the same time, the construction of new facilities will diminish as new right-of-way becomes scarce and prohibitively expensive. The increased demand for transportation resources will also reduce the time available for performing maintenance operations. These are just some of the problems that Caltrans will face in managing California's transportation system in the future.

For future infrastructure construction projects, a high priority must be given to increasing the durability of building materials and to developing better methods of construction. Plastic or composite construction materials may prove to be more durable than conventional materials at a comparable cost. Modular construction techniques, where the necessary components are pre-fabricated and are then assembled at the project site, will save time and money on construction projects. These improvements will lead to a longer lifetime and a reduced life cycle cost for the infrastructure. They will also increase the system's reliability and minimize the amount of maintenance necessary to keep it operating. In addition, better test methods for evaluating the performance of a construction project should be developed to determine in advance if it will meet the needs of the public.

Future transportation systems will be increasingly dependent on computer and sensor technologies to enable them to make traffic management decisions based on data collected from the system. Maintenance will play a critical role in keeping the system operating, since failure of key components could result in a system shut-down or a reduced level of service. Developing the ability to perform maintenance on the infrastructure without affecting the free flow of traffic will also be vitally important. Maximizing the reliability of the infrastructure through improved maintenance operations will result in more time between required maintenance and fewer lane closures, reducing highway congestion.

Current research efforts concentrate on developing products and processes that improve the efficiency and safety of traditional highway construction and maintenance operations in both urban and rural environments. This research provides a foundation on which to further develop the materials, methods, and equipment appropriate for an ATS. Recent advances in industrial manufacturing and computing capabilities, coupled with the adaptation of many military technologies to civilian use, have created a vast technology base from which to re-evaluate many conventional construction and maintenance operations.

Future research projects will employ the

Highway users will benefit from reduced congestion and incidents as a result of more efficient operations.

Elements of ATS: Infrastructure Construction and Maintenance

Highway workers will benefit from improved safety resulting in fewer fatalities and reduced injuries.

Highway operation costs will decrease and efficiency will increase significantly.

latest in technological developments, such as automation and robotics, to perform tasks quickly, efficiently, reliably, and safely. The introduction of automated equipment into a traditionally manual field has set a precedent for further technological advancement in the areas of infrastructure construction and maintenance, with the technologies developed for traditional operations being applied to ATS operations. Automated and robotic equipment developed through the ATS Program will evolve from manually controlled systems to teleoperated systems, then to supervisory controlled systems, and finally, to autonomous systems. A wide variety of new operations will be necessary as the ATS is designed and deployed. These new operations could include such tasks as modular construction of roadway and structural elements, embedded sensor installation, remote roadway/roadside infrastructure diagnostics and management, electronic maintenance fleet dispatch, and embedded roadway integrity sensing. As the ATS deployment has a 15-year horizon, the schedule for deployment of complementary infrastructure construction and maintenance operations shows a 15-year cycle, as well.

Deployment Estimates/Milestones

The following charts illustrate the anticipated deployment schedule for ATS user services, six of which depict major transportation environments typically referred to as User Services Bundles by ITS America. These charts are: Public Transportation, Goods Movement, Private Vehicle, Rural, Transportation Demand Management, High-Speed Intercity and Infrastructure Construction and Maintenance. **The milestones shown are for approximate initial deployment of user services in a given environment and do not represent the entire deployment period.**

Deployment of ATS is oriented toward serving the needs of transportation customers through user services and the user services bundles. Caltrans and other participants in ATS deployment are continuously working to ensure that ATS is serving user needs. Current nationwide efforts that specifically address this issue include the National ITS Architecture Development Program and consumer acceptance research being done at the Volpe National Transportation Systems Center. In California, several public/private partnerships, such as the Southern California Economic Partnership, are engaging in studies and outreach that will help identify local needs that can be served by ATS and the capacity of the public and private sector to meet those needs.

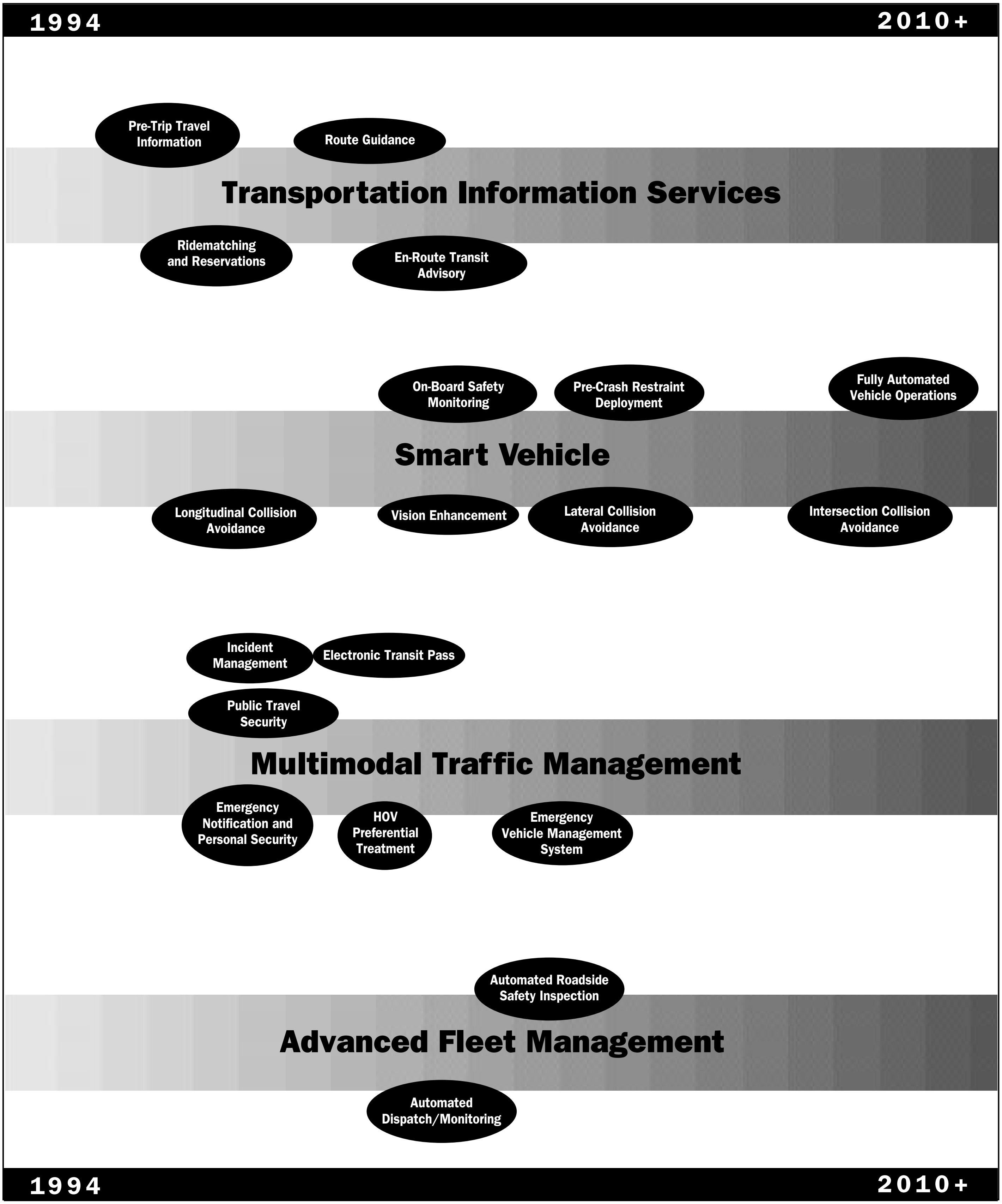
In most cases deployments will occur over several years, often starting in one environment before being adopted in others. Also, initial deployments will typically be first-generation products and services, becoming more sophisticated over the deployment period (and extending the deployment period). For example, early transportation information systems will generally involve the best-available information services, with latter generations incorporating real-time information, as well as transactional services.

In addition to the ATS user services for the six major transportation environments, the program includes a robust Automated Highway Maintenance Construction Technology (AHMCT) element. A program milestone chart which illustrates the development and deployment of these technologies follows the ATS user services deployment milestone charts. This program differs from the remainder of the program in that these technologies are not part of the "user services" within the national program definition.

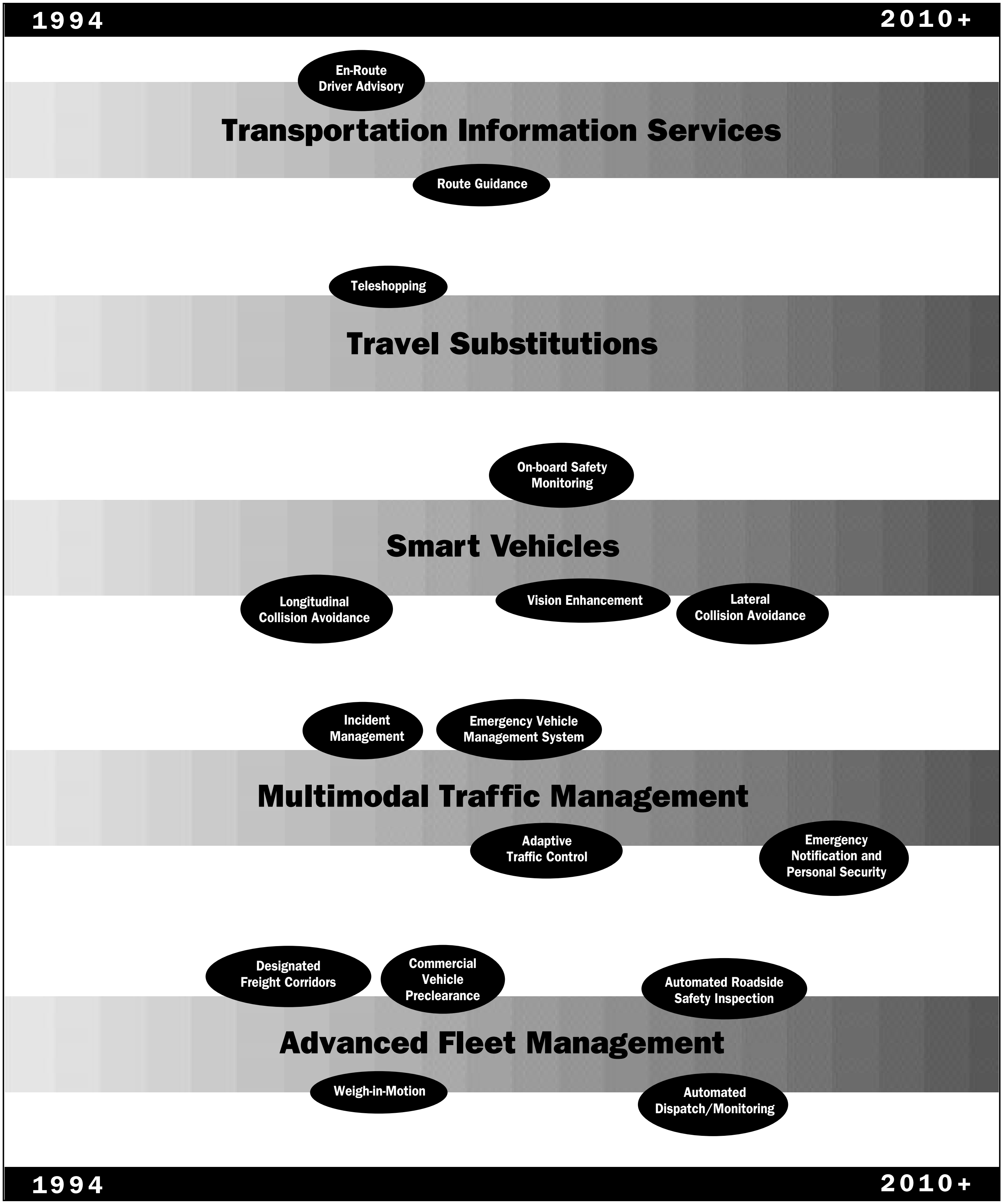
Deployment estimates are based on a scenario that assumes that all ATS partners, public and private, play their full roles; and that Caltrans aggressively pursues the policy and legislative initiatives which fully support the ATS Program, as outlined in this document.

The milestones shown are for approximate initial deployment of user services in a given environment and do not represent the entire deployment period. In most cases deployments will occur over several years.

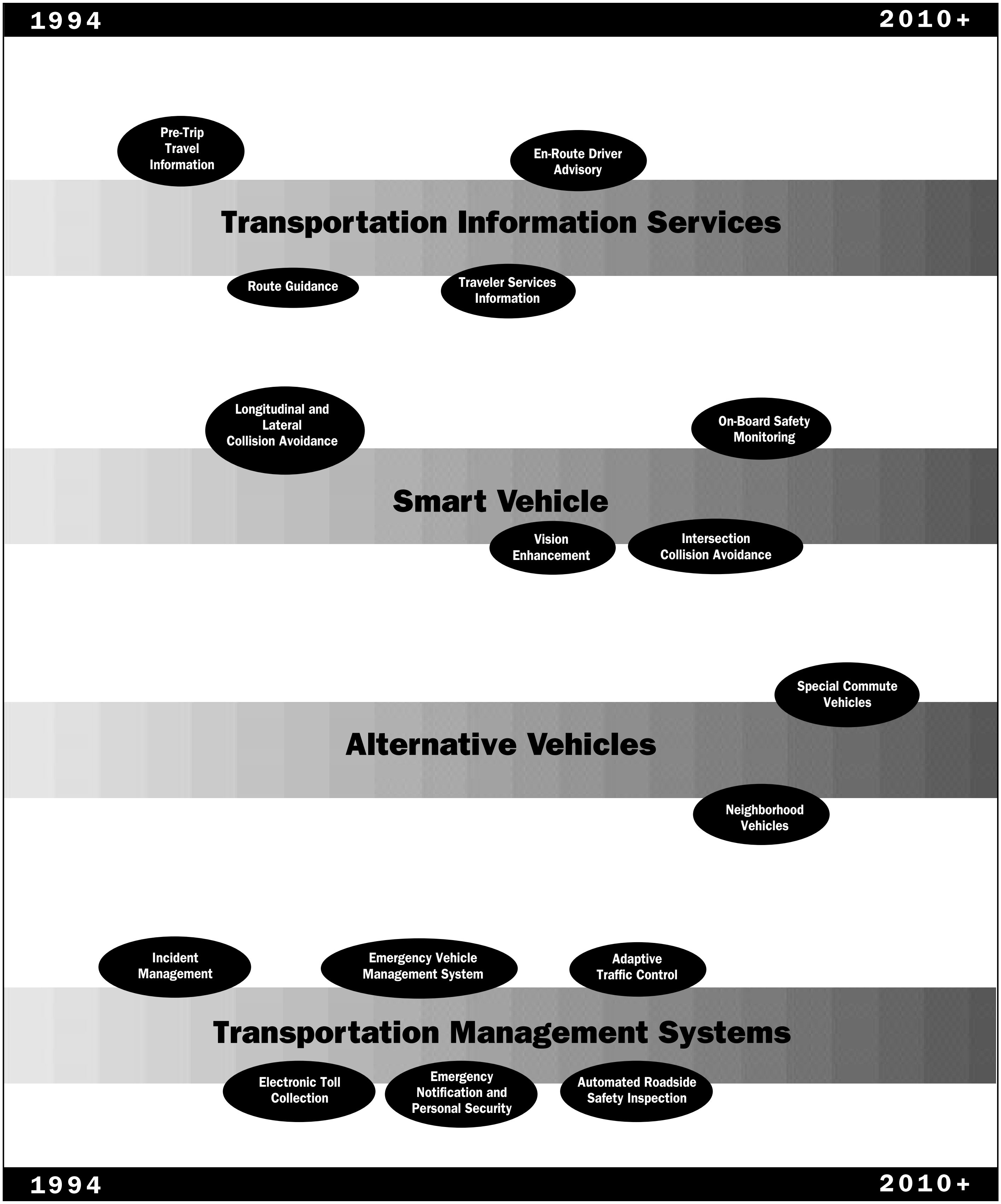
Public Transportation



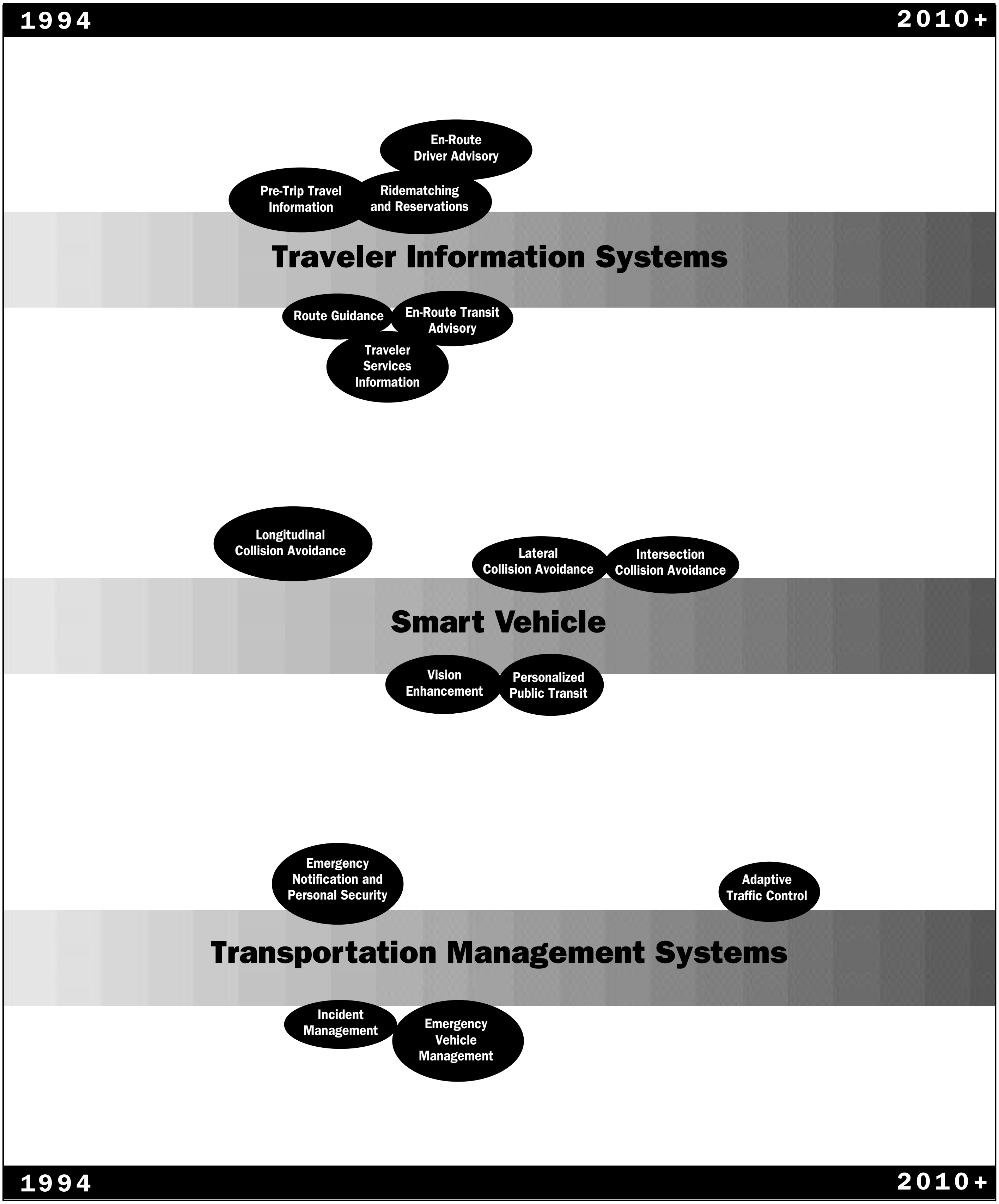
Goods Movement



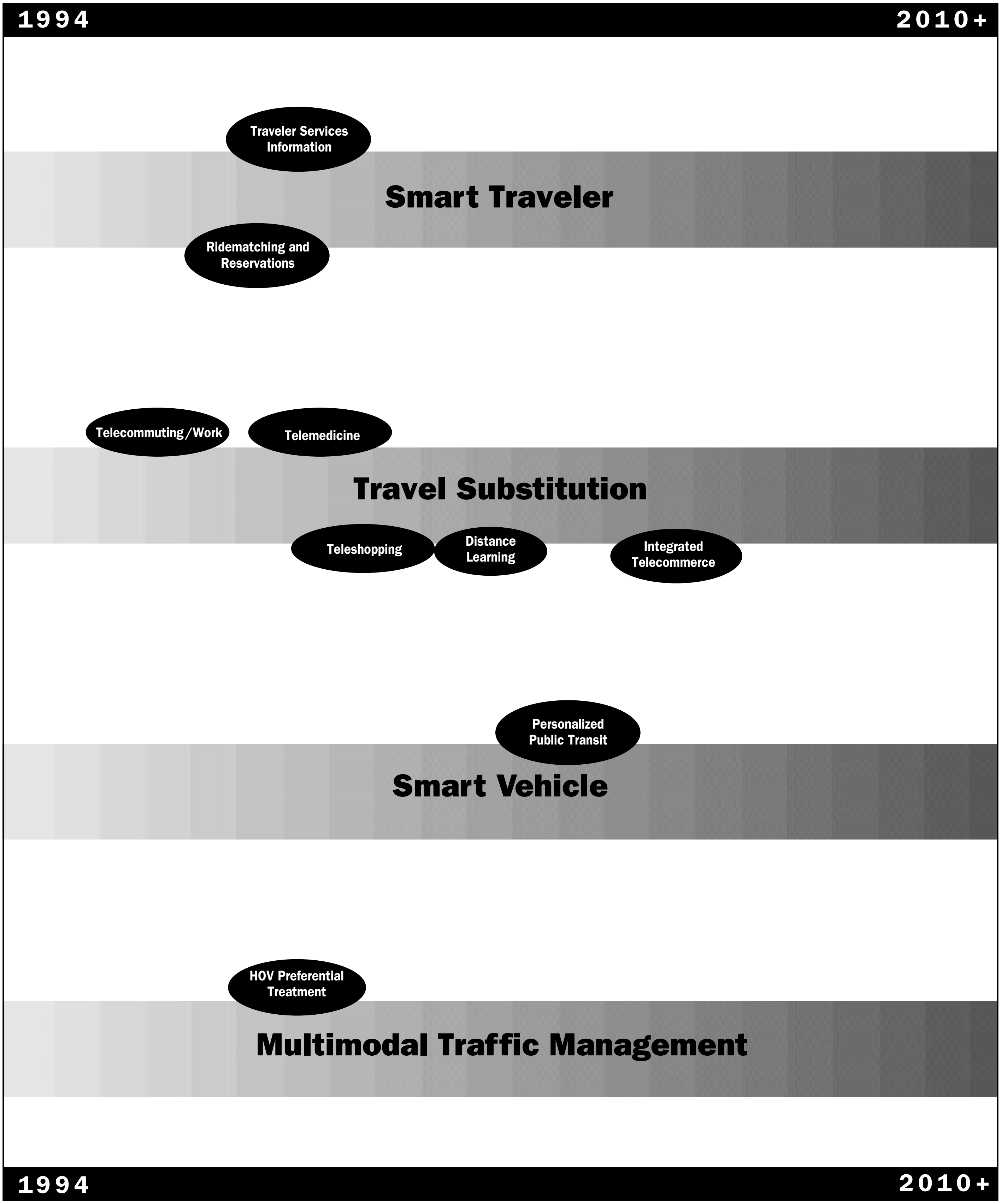
Private Vehicle



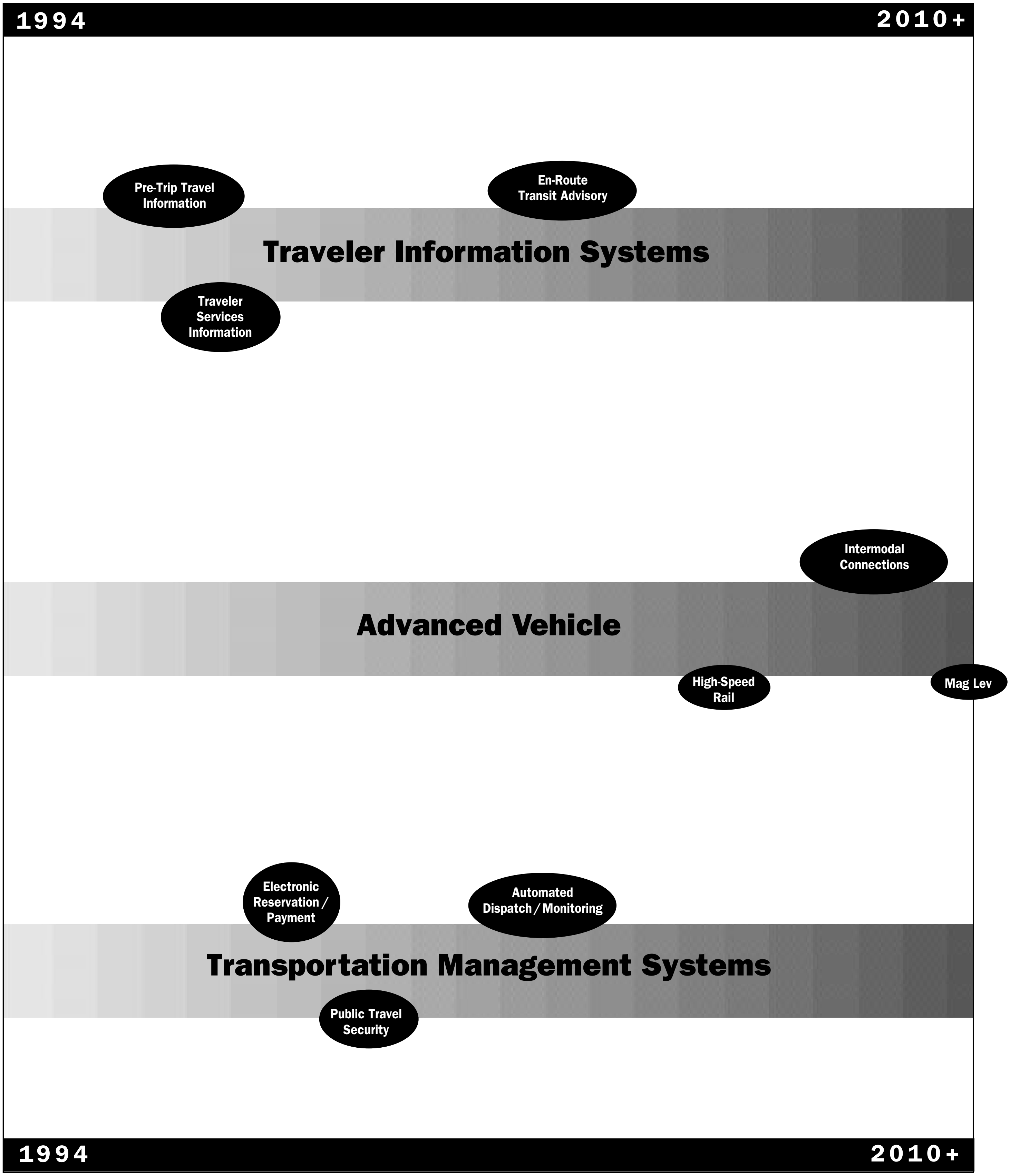
Rural


1994
2010+
En-Route
Driver Advisory
Pre-Trip Travel
Information
Ridematching
and Reservations
Traveler Information Systems
Route Guidance
En-Route Transit
Advisory
Traveler
Services
Information
Longitudinal
Collision Avoidance
Lateral
Collision Avoidance
Intersection
Collision Avoidance
Smart Vehicle
Vision
Enhancement
Personalized
Public Transit
Emergency
Notification and
Personal Security
Adaptive
Traffic Control
Transportation Management Systems
Incident
Management
Emergency
Vehicle
Management
1994
2010+

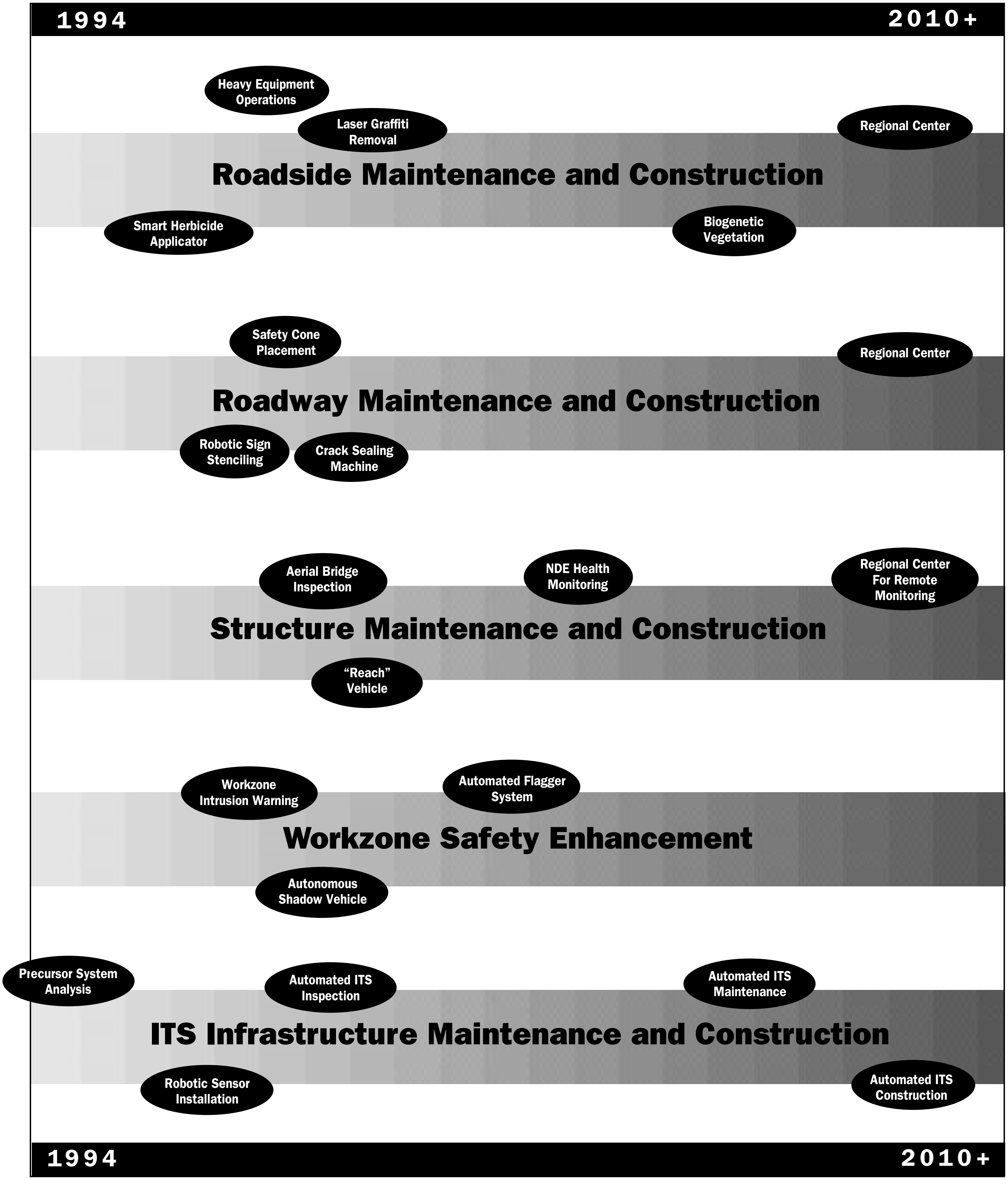
Transportation Demand Management



High-Speed Intercity



Infrastructure Const. and Maint.



Deployment Evolution

The ATS Program will support the deployment of new products and services as public and private roles are delineated.

Building Blocks and Their Integration

Much of ATS deployment involves technologies such as telecommunications, sensors, information and map databases, computers and various user interfaces (phone, TV, control panel, etc.) which form building block systems to provide stand-alone user services in the near-term. These include pre-trip planning services, real-time traffic management/incident response and vehicle-based collision warning. Because of the building block nature of these systems, initial user services can be upgraded and combined in the longer term to provide more comprehensive and effective mobility. For example, the vision of a public transportation service that is truly competitive with the single-occupant automobile involves the deployment of advanced fleet management, traffic management and traveler information systems. Integrating these building block systems will be made possible by adherence to interface standards and protocols organized by an overall systems architecture now in development (see next sections). This evolutionary "packaging" of services is illustrated on the following pages for three development scenarios which encompass public and private transportation and both people and goods movement:

- Personalized Public Transportation,
- Integrated Goods Movement and Travel; and,
- Private Vehicle Transportation.

First foldout goes here

Second foldout goes here

Third foldout goes here

An estimate of the cost-effectiveness of advanced technological approaches is important to decision makers who must allocate limited transportation resources efficiently. However, most of the technologies addressed in the Caltrans ATS Program are still in relatively early stages of development, making estimates of costs and benefits extremely speculative. Indeed, one of the strongest arguments for continuing research into technology opportunities in transportation is to be able to estimate costs and benefits more accurately. Nevertheless, by using experience in operational improvements and technology research results to date, and making some fairly broad assumptions and extrapolations, magnitudes of costs and benefits and cost-effectiveness ranges can be scoped. Within this context, the following discussion and estimates are offered.

General Benefits

The benefits to be gained will depend on what technology packages policy makers decide to deploy. The technologies included in the Caltrans ATS Program, when combined, have the potential to produce the following benefits:

- Better utilization and increased productivity of existing roadway and transit systems making travel easier, safer and more accessible;
- Reduced number and severity of traffic accidents;
- Improved responses to accidents and other incidents;
- Expansion of transit/paratransit service options;
- Expanded options for transportation demand management;
- More efficient trucking and other commercial vehicle operations;
- Integration of transportation modes into a truly intermodal/multimodal system;
- Improved fuel efficiency and reduced reliance on petroleum for transportation energy;
- Enhanced health of California's defense and electronics industries;
- Improved air quality through reduced trips (telesubstitution) and reduced Vehicle Miles Traveled (VMTs) (from more efficient travel and better connectivity);
- Greater financial benefits for business through better system efficiency leading to a reduction in costs; and,
- Enhanced economic competitiveness.

Nature Of Costs Incurred

The costs associated with the ATS Program are initially, and primarily, those related to research, development, testing, and evaluation of advanced technology applications in transportation. Generally, these costs will be minor in comparison to the capital, operating and maintenance costs involved in deploying advanced transportation systems.

In the case of "smart" technology, deployment will involve incremental costs over those that will be incurred with increasing vehicle electronic content, and the implementation of transportation operations systems for freeway management and advanced traffic signal control systems. These are baseline improvements that will continue to be made in vehicles and in the transportation infrastructure, and form the foundation on which ATS can be built.

Benefits and Costs

Deployment of ATS technologies will occur both on the public infrastructure and in the marketplace. Total estimated cost for the 15-year period would be: public–$4.6 billion and private–$19 billion.

Cost Distribution

California's Share of Research Costs

The ATS Program seeks to share research and development costs for transportation technology with other state and local agencies, the federal government, and the private sector. A basic program objective is to achieve a one-third state funding share with the balance coming from other sources.

User Costs

It is difficult to estimate distribution of user costs before determining how technology applications will be packaged and deployed. It is Caltrans' intent to address equity issues as its technology program advances. However, a few general observations can be made now.

Transportation technology applications seek to build on technological advances already in the pipeline and, therefore, will involve mostly incremental costs to the user.

Since incremental ATS infrastructure improvements could be funded through existing program categories, costs could be distributed in the same way baseline costs are distributed. Distribution of user costs will, therefore, reflect policy decisions on how transportation revenues are collected and distributed, what modes are subsidized and by how much, etc. New products, such as the small commuter car, might require separate funding. In this case, user cost distribution would depend on how the separate funding was provided (again, a policy decision).

Deployment Cost Estimates for five-year periods [ITS only]
(in millions of dollars)

Sector	5 Years	5-10 Years	10-15 Years	Total
Public	400	1,500	2,700	4,600
Private	1000	5,200	12,800	19,000
TOTAL	1400	6,700	15,500	23,600

The market will likely drive vehicle technology cost distribution. At the vehicle end, therefore, ATS products and service costs will be borne by those who will use these products and services. Given past trends in the vehicle industry, these technologies will penetrate at the higher end of the market and at a higher cost, but quickly become pervasive throughout the market at much lower costs as economies of scale and technological advances are made. Finally, ATS market penetration will continue to occur in commercial vehicle operations and other fleet operations (including transit) in advance of personal transportation.

Cost Estimates

Deployment of ATS technologies will occur both on the public infrastructure and in the marketplace. Given that ATS efforts are still in research and testing stages, overall deployment costs cannot be estimated with a high level of certainty or precision. However, the magnitude of these costs, and their public vs. private market shares, can be approximated by applying ITS America estimates to California. Such costs reflect ITS deployment only, and are exclusive of alternative vehicle/fuel, high-speed ground, air and intermodal facility deployments. Based on the ITS America estimates, the California deployment costs would be experienced over five, ten and 15 years (see table).

Deployment cost estimates will be refined as ATS Program research and testing progress. Also, public sector deployment costs will be identified by region as Early Deployment Plans are developed (see page 77).

Cost-Effectiveness Considerations

The ATS Program is primarily an applied research effort. Its objective is to capture the maximum productivity from existing transportation resources, as well as any new resources that may be added in the future. The approach is to leverage, with only incremental expenditures, substantial additional benefits out of baseline facilities and services that often entail large investments. The application of advanced technology to transportation is essentially advanced Transportation Systems Management (TSM). As such, Caltrans envisions that it should realize the same high benefit/cost ratios as conventional TSM, at a higher level of overall cost and benefit. The chart (below) illustrates gross benefit/cost ranges for conventional transportation measures compared with what is expected from advanced technology initiatives.

Beyond the TSM analogy, longer-term synergies from advanced technologies could lead to very different types of transportation systems. One example of this, already cited, would be the development of a type of personalized rapid transit to service most passenger travel in the state. It is almost impossible to speculate about the benefits and costs of such synergism at this time. However, as research progresses, Caltrans will evaluate and report on these broader options and impacts. This constant and continuing evaluation of research findings and deployment testing will help eliminate the possibility of a misdirection of limited future resources, which could have significant consequences in realizing objectives.

Evaluation of Benefits and Costs

One of the fundamental objectives of the ATS Program is to identify actual benefits and costs associated with the full range of ATS applications. As technology development moves from research into field testing, vigorous evaluations will be performed under the direction of Partners for Advanced Transit and Highways (PATH) and other experts. Individual evaluations will progressively add to the body of knowledge of overall ATS cost effectiveness. An area of particular interest will be the maintenance and operational requirements of new systems. Life cycle benefit-cost profiles will be developed for each ATS user service before full deployment is pursued.

Individual project evaluations will be combined with new area-wide land use and transportation tools to give an improved understanding of the broad range of effects and interactions, including the interactions between modes that will occur with the implementation of the project.